

Notwithstanding the prior considerations, it is contemplated that it may be desirable to provide a cleaning composition within the scope of the present invention which has a viscosity so high as to be considered more gelatinous in nature rather than liquid. In such a case, the modification of the ranges thus described above for the constituents outlined is readily performed by way of routine experimentation so that the viscosity may be adjusted in order to provide such a gelatinous characteristic.

Such may be desired for example wherein the use of a dispensing apparatus other than an aerosol, or manually pumpable dispenser and the like is used. Such compositions may be particularly desirable wherein a gelled composition would be particularly beneficial.

The present invention further comprises an emulsifying agent. This constituent is essential to the water solubilization of the organopolysiloxane fluid. Emulsifying agents are quite variable in molecular structure, but generally comprise an amphipathic structure with an oil-soluble hydrocarbon chain and a water-soluble ionic or polar group. One good example is a carboxylate, such as a high molecular weight carboxypolyalkylene. An example of such a material is a polyacrylic acid resin. The carboxylic side groups of this resin are ionized in the presence of a basic pH-adjusting agent. Ionization is necessary to activate the resin by uncoiling it, exposing the acidic side chains, promoting hydrophilic interactions and enabling the necessary emulsion to be formed. Other examples of the emulsifying agents which are particularly preferred are carboxypolymethylene resins, e.g. materials marketed under the tradename CARBOPOL (The B. F. Goodrich Co., Cleveland Ohio). Specific examples of CARBOPOLS are those marketed as CARBOPOL 1621 and CARBOPOL 1622.

Such emulsifying agents are present in the inventive emulsion composition to the extent that they are effective to promote emulsification. They are generally used from about 0.1 wt % to about 1.0 wt %. A more desirable wt % range is from about 0.20 to about 0.32% based on the weight of the aqueous emulsion composition as a whole.

Nonionic surfactants are also added to the new compositions. It is believed that small particle size of the organopolysiloxane fluid droplets (which can be less than about 2 microns) in the inventive emulsion composition greatly facilitates penetration of the organopolysiloxane fluid into the surface to be protected. To that end, nonionic surfactants are added to the present composition in order to yield smaller emulsion particle sizes. Thus, the nonionic surfactants act as secondary emulsifiers and it is expected that known nonionic surfactants can be used.

Desirable nonionic surfactants include linear and branched primary and secondary and alkylaryl alkoxyated alcohols. The surfactant group preferably consists of linear and branched primary and secondary alkoxyated alcohols. Even more preferably, the surfactant group consists of linear primary and secondary ethoxyated alcohols. Most preferably, the surfactant group consists of linear primary and secondary ethoxyates of carbon chain length of between 8 and 18 atoms.

Examples of particularly useful nonionic surfactants are alcohol alkoxyates such as those marketed under the tradename POLY-TERGENT SL-series of surfactants (Olin Corp.). Other examples of nonionic surfactants are alkoxyated glycols and glycol esters such as PEGOLF 88 (Rhône-Poulenc Surfactant and Specialty Division) and INTERWET (Akzo Chemicals Inc.). Such nonionic surfactants should be present with the inventive emulsion compositions in amounts that ensure stable emulsions. An example of such

an amount is 0.1% to 6% by weight. Particularly useful is the weight % range of from 0.5% to 5% by weight.

An amino-functional organopolysiloxane-containing fluid is included in the compositions described in the invention. Such are typically provided in the form of an aqueous emulsion. The addition of such a constituent aids in the reduction of the undesirable greasy feel of the residual silicone layer after it is deposited upon the treated surfaces and has been allowed to dry. Further, the addition of this constituent is believed to provide an improved protective layer to the treated surface.

The amino-functional organopolysiloxane-containing fluid desirably comprises amino-functional dimethylpolysiloxanes. Especially useful are amino-functional dimethylpolysiloxanes which, by way of non-limiting examples, include N,N-dialkyl dimethylpolysiloxanes, N,N-diaryl dimethylpolysiloxanes, and N-alkyl-N-aryl dimethylpolysiloxanes. Mixtures of the above are also suitable.

It has been found that the inclusion of up to about 10% by weight, based on the total weight of the inventive composition, of a commercially available amino-functional organopolysiloxane-containing fluid provides increased adherence to the surface to be protected. These fluids typically contain 35% to 50% active amino-substituted organopolysiloxanes by weight, with an additional 10% emulsifier, 5% rust inhibitor, and approximately 65% water by weight. An example of such a commercially available fluid is Dow Corning Cationic 929 Silicone Emulsion. This combination is particularly advantageous for treatment of metal surfaces. The present composition may be formed with amounts of amino-functional dimethylpolysiloxane-containing fluids from about 2% to about 8% by weight, or more desirably, about 4% to about 6% by weight, based on the weight of the amino-functional fluid.

In order to obtain a maximal cleaning benefit sought in the new composition, one or more anionic surfactants are required. Useful anionic surfactants are exemplified by various alkyl-, aryl- and alkylaryl- sulfates and sulfonates. Further examples of these are classes of compounds such as alkylphenols, and sulfated acids, amides, and esters and particularly salts thereof. Sulfonates such as alkylbenzenesulfonates, alkylarenesulfonates, and ester-, amide-, or ether-linked sulfonates are also useful and their salts are particularly useful. A particularly well-known example is the anionic surfactant sodium lauryl sulfate. This constituent is desirably present in the inventive composition from 0.01% to 5% by weight, and preferably from about 1 to about 2% by weight.

Compositions of the invention further comprise at least one organic solvent constituent, such as a member of the general solvent class of alcohols, glycols or polyols. Useful organic solvents include, for example, glycol ethers including the general structure R_a-O-R_b-OH , wherein R_a is an alkoxy of 1 to 20 carbon atoms, or aryloxy of at least 6 carbon atoms, and R_b is an ether condensate of propylene glycol and/or ethylene glycol having from one to ten glycol monomer units. Preferred are glycol ethers having one to five glycol monomer units. These are C_3-C_{15} glycol ethers. Examples of more preferred solvents include propylene glycol methyl ether, dipropylene glycol methyl ether, tripropylene glycol methyl ether, propylene glycol isobutyl ether, ethylene glycol methyl ether, ethylene glycol ethyl ether, ethylene glycol butyl ether, diethylene glycol phenyl ether, propylene glycol phenol ether, and mixtures thereof.

More preferably employed as the solvent is one or more of the group consisting of ethylene glycol n-butyl ether, diethylene glycol n-butyl ether, dipropylene glycol n-propyl